



MKM Engineers, Inc.

REMOVAL ACTION WORK PLAN

Final Removal Action Work Plan for

**FTIR 38 Goldstone Lake Mortar/Small
Arms Range and FTIR 40 Mojave Anti-
Aircraft Range**

**National Training Center
Fort Irwin, CA**

Submitted to:

**USACE Sacramento District
1325 J Street
Sacramento, CA 95814-2922**

**Army Environmental Center
Building E4460
Aberdeen Proving Grounds, MD 21010**

Submitted by:

**MKM Engineers
5025 Arnold Avenue, Building 24
Sacramento, CA 95662**

Contract No. W911S0-04-P-0015


August 2005



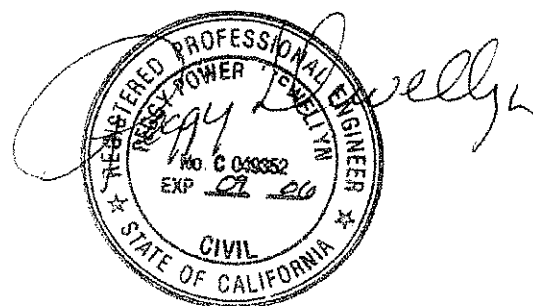
REMOVAL ACTION WORK PLAN
REMOVAL ACTION AT FTIR 38 AND FTIR 40
NATIONAL TRAINING CENTER, FORT IRWIN, CALIFORNIA

Removal Action Work Plan
for
FTIR 38 Goldstone Lake Mortar/Small Arms Range and
FTIR 40 Mojave Anti-Aircraft Range, National Training Center, Fort Irwin, CA

Reviewed by:  Date: Aug 17, 2005
Srinivasa, Ph D., MKM Project Manager

Reviewed by:  Date: 8/17/05
Donald Brenneman, MKM Vice President Operations

Reviewed and
Approved by:  Date: 8/17/05
Peggy Lewellyn, PE MKM Quality Control Manager
California Professional Civil Engineer #C 49352 Expiration 9/30/2006





REMOVAL ACTION WORK PLAN
REMOVAL ACTION AT FTIR 38 AND FTIR 40
NATIONAL TRAINING CENTER, FORT IRWIN, CALIFORNIA

CONTENTS

CONTENTS	ii
TABLES	iii
1.0 Introduction	1
1.1 Removal Action Work Plan Organization	1
1.2 Project Organization	2
1.2.1 Fort Irwin	2
1.2.2 Army Environmental Center	2
1.2.3 Regulatory Agency Oversight	3
1.2.4 MKM Engineers, Inc	3
2.0 Site Background	4
2.1 Site History	4
2.2 Site Description	4
2.3 Site Geology and Hydrogeology	5
2.4 Climate	5
2.5 Flora and Fauna	6
2.6 Archaeological History	7
2.7 Previous Investigations	7
2.7.1 FTIR-38	7
2.7.2 FTIR-40	8
3.0 Removal Action Goals and Alternatives	10
3.1 Removal Action Goals	10
3.2 Response Action Alternatives	11
3.3 Removal Action Activities	13
3.4 Compliance with ARARs	14
3.4.1 Chemical Specific ARARs	15
3.4.2 Location Specific ARARs	15
3.4.3 Action Specific ARARs	15
4.0 Site-Specific Work Plan	20
4.1 Removal Action Objectives	20



REMOVAL ACTION WORK PLAN
REMOVAL ACTION AT FTIR 38 AND FTIR 40
NATIONAL TRAINING CENTER, FORT IRWIN, CALIFORNIA

4.2	Site Planning	21
4.3	Cultural Resources	21
4.4	Site Security	21
4.5	Site Reconnaissance	21
4.6	Site Mobilization	23
4.7	Dust Control and Air Monitoring	23
4.8	Soil Excavation and Screening	24
4.8.1	FTIR-38	24
4.8.2	FTIR-40	26
4.9	Sampling and Analysis	27
4.10	Backfill and Site Restoration	27
4.11	Closure Report	27
5.0	References	28

TABLES

Table 2-1	Weather Data for Barstow California from 1960 to 1999
Table 3-1	Site Specific Cleanup Levels for FTIR-38 and FTIR-40
Table 3-2	Areas where Soil exceeds the Cleanup Goals for FTIR-38 and FTIR-40 National Training Center, Fort Irwin, California
Table 3-3	Applicable and Relevant Regulations (ARARs)

FIGURES

Figure 1-1	Fort Irwin FTIR-38 and FTIR-40 Project Organizational Chart
Figure 2-1	Regional Map, Fort Irwin National Training Center
Figure 2-2	FTIR-38 and FTIR-40 Site Location Map
Figure 2-3	FTIR-38
Figure 2-4	FTIR-40
Figure 3-1	FTIR-38 Area 2 – Northwest Berms Removal Action Plan
Figure 3-2	FTIR-38 Area 2 – Southwest Berms Removal Action Plan
Figure 3-3	FTIR-40 Area 1.1 Removal Action Plan
Figure 4-1	Cantonment Area
Figure 4-2	On-Site Source for Clean Imported Fill



REMOVAL ACTION WORK PLAN
REMOVAL ACTION AT FTIR 38 AND FTIR 40
NATIONAL TRAINING CENTER, FORT IRWIN, CALIFORNIA

APPENDICIES

Appendix A	Administrative Record
Appendix B	Sampling and Analysis Plan and Quality Assurance Plan
Appendix C	Site Specific Health and Safety Plan
Appendix D	MEC Avoidance and Construction Support Plan
Appendix E	Waste Minimization Plan and Storm Water Pollution Prevention Plan
Appendix F	Mitigated Negative Declaration and CEQA Process
Appendix G	Recalculation of the Lead Cleanup Goal
Appendix H	Mohave ground squirrel and Burrowing Owl Mitigation Plans
Appendix I	Response to Agency Comments
Appendix J	Agency Approval Letters



REMOVAL ACTION WORK PLAN
REMOVAL ACTION AT FTIR 38 AND FTIR 40
NATIONAL TRAINING CENTER, FORT IRWIN, CALIFORNIA

ACRONYMS

AEC	Army Environmental Center
AOC	Area Of Concern
AQMD	Air Quality Management District
ARARs	Applicable Or Relevant And Appropriate Regulations
CalEPA	California Environmental Protection Agency
CCR	California Code of Regulations
CDAP	Chemical Data Acquisition Plan
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CFR	Code Of Federal Regulations
CIH	Certified Industrial Hygienist
COCs	Contaminants Of Concern
COE	Chemicals Of Ecological Concern
COR	Contracting Officer's Representative
CWM	Chemical Warfare Material
DFG	Department of Fish and Game (California)
DoD	Department of Defense
DQOs	Data Quality Objectives
DTSC	California Department Of Toxic Substance Control
ELAP	Environmental Laboratory Accreditation Program
EM	Engineer Manual
EOD	Explosive Ordnance Disposal
EOR	Explosive Ordnance Reconnaissance
EP	Engineering Pamphlet
ERA	Ecological Risk Assessment
EZ	Exclusion Zone
FS	Feasibility Study
GPS	Global Positioning System



REMOVAL ACTION WORK PLAN
REMOVAL ACTION AT FTIR 38 AND FTIR 40
NATIONAL TRAINING CENTER, FORT IRWIN, CALIFORNIA

HE	High Explosives
HHRA	Human Health Risk Assessment
Ha	Alternative Hypothesis
Ho	Null Hypothesis
LDR	Land Disposal Restrictions
LOCID	Location Identification
MEC	Munitions And Explosives Of Concern
mg/kg	Milligrams Per Kilogram
MKM	MKM Engineers, Inc.
MPPEH	Material Potentially Presenting an Explosive Hazard
MS/MSD	Matrix Spike/ Matrix Duplicate Spike
MWH	Montgomery Watson Harza
NASA	National Aeronautics and Space Administration
NIOSH	National Institute Of Occupational Safety And Health
NTC	National Training Center
OSHA	Occupational Safety And Health Administration
PM	Project Manager
PPE	Personal Protective Equipment
QA	Quality Assurance
QAP	Quality Assurance Plan
QC	Quality Control
RAW	Removal Action Work Plan
RC	Response Complete
RI	Remedial Investigation
RPM	Remediation Program Manager
SAP	Sampling And Analysis Plan
SI	Site Investigation
SOP	Standard Operating Procedure
SOW	Scope Of Work
SSCL	Site Specific Cleanup Levels
SSHP	Site Specific Safety And Health Plan



REMOVAL ACTION WORK PLAN
REMOVAL ACTION AT FTIR 38 AND FTIR 40
NATIONAL TRAINING CENTER, FORT IRWIN, CALIFORNIA

STL	Severn Trent Laboratories
SUXOS	Senior UXO Supervisor
SVOCs	Semi-Volatile Organic Compounds
SWPPP	Storm Water Pollution Prevention Plan
TP	Technical Paper
TRPH	Recoverable Petroleum Hydrocarbons
TSDF	Treatment Storage and Disposal Facility
USACE	U.S. Army Corps Of Engineers
USEPA	U.S. Environmental Protection Agency
UXO	Unexploded Ordnance
VOCs	Volatile Organic Compounds



1.0 Introduction

MKM Engineers, Inc. (MKM) has prepared this Removal Action Work Plan (RAW) under contract number W9511SO-04-P-0015 to serve as a guidance document for the implementation of the Response Complete (RC) at FTIR-38 Goldstone Lake Mortar/Small Arms Range (FTIR-38) and FTIR-40 Mojave Anti-Aircraft Range (FTIR-40) at the National Training Center, Fort Irwin, California (Fort Irwin). This RAW has been prepared to satisfy the requirements under MKM's contract with the Army Environmental Center (AEC) and in accordance with the Request for Quote under the Statement of Work Section 3.1.2.

In accordance with California Code of Regulations (CCR), Health and Safety Code Section 25356.1, the State of California requires that a RAW be prepared for remedial projects where the projected cost is less than \$1 million. The RAW has a specific outline and required information prescribed by the State of California.

1.1 Removal Action Work Plan Organization

This RAW has been prepared in accordance with agency guidance and document compliance and contains the following major sections:

- **Section 1.0** is an introduction to the project and the project team and briefly discusses the roles and responsibilities of the various team members;
- **Section 2.0** contains a description of the site, ownership history, operational history, onsite conditions, geology and hydrogeology, previous investigation and previous response actions taken;
- **Section 3.0** summarizes the goals to be achieved by the removal actions and the alternative removal measures that were considered in the feasibility study to achieve those goals;
- **Section 4.0** presents a description of the techniques and methods that will be used to perform the removal action;
- **Appendix A** contains the Administrative Record for the site.
- **Appendix B** is the Sampling and Analysis Plan (SAP) and Quality Assurance Plan (QAP) to confirm effectiveness of the RAW;
- **Appendix C** contains the Site Specific Health and Safety Plan (SSHP);
- **Appendix D** contains the Munitions and Explosives of Concern (MEC) Avoidance and Construction Support Plan;
- **Appendix E** is the Waste Minimization Plan and Storm Water Pollution Prevention Plan;
- **Appendix F** is the Mitigated Negative Declaration and California Environmental Quality Act (CEQA) Process;
- **Appendix G** presents the Recalculation of Lead Cleanup Goals;

- **Appendix H** presents the Mojave Ground Squirrel and the Burrowing Owl Mitigation Plans; and
- **Appendix I** is the Response to Agency Comments.
- **Appendix J** contains approval letters from DTSC and DFG.

1.2 Project Organization

The principle groups involved in this project include Fort Irwin, the Army, the U.S. Army Corps of Engineers (USACE) Sacramento District, California Environmental Protection Agency (CalEPA), the California Department of Toxic Substance Control (DTSC), and MKM. Figure 1-1 is the project organizational chart depicting the lines of authority and communications that will be followed during implementation of this project. Specific roles and responsibilities of each of these groups and personnel within those groups are discussed in the sub-sections below.

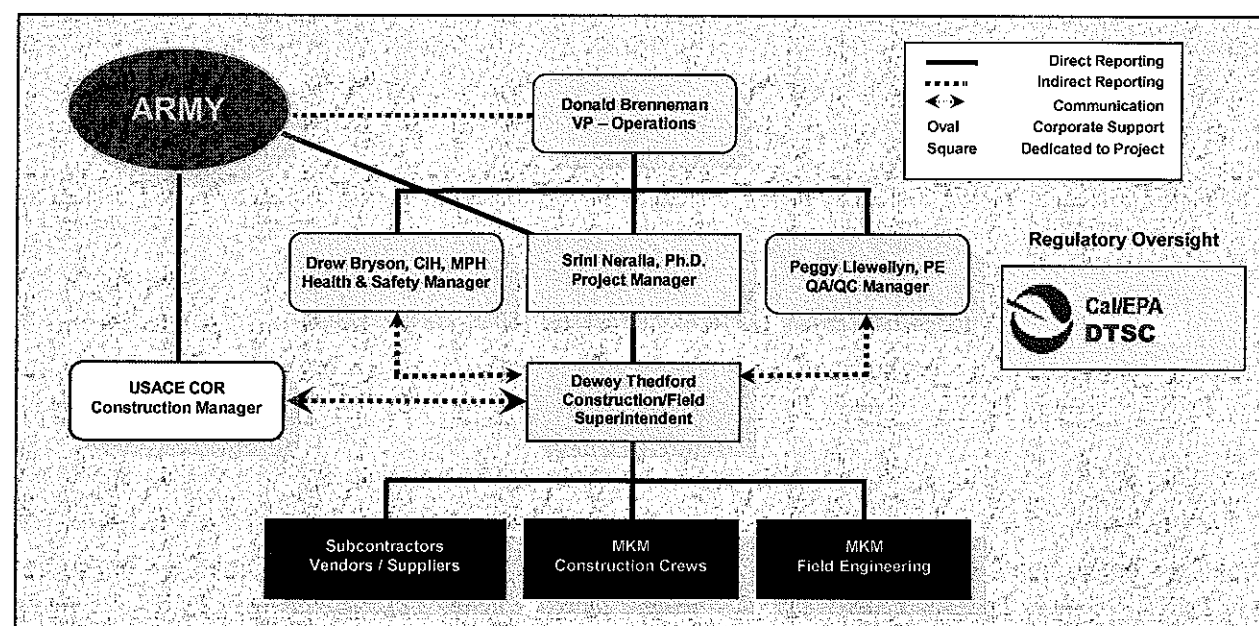


Figure 1-1. Fort Irwin FTIR-38 and FTIR 40 Project Organizational Chart

1.2.1 Fort Irwin

As the property owner, the U.S. Army Fort Irwin has ultimate responsibility for activities on the installation. The Remediation Program Manager (RPM) for Fort Irwin is Ms. Justine Dishart. In this role, Ms. Dishart has ultimate responsibility for the implementation of remedial actions at the installation. Ms. Dishart will be the primary point of contact with the regulatory agencies, the Army Environmental Center, and the Army.

1.2.2 Army Environmental Center

Ms. Sophie Ngu of the USACE Sacramento District is the contracting officer's Representative (COR). Mr. Guy Romine is the AEC Project Manager.



1.2.3 Regulatory Agency Oversight

The California Environmental Protection Agency, Department of Toxic Substance Control is the lead agency for the remedial activities at Fort Irwin. Mr. Douglas Bautista (replaced Mr. Curtis Plotkin in May 2005) is the DTSC Project Manager for this project and will provide regulatory overview, as well as coordinate interagency review of documents. Mr. Bautista will approve the RAW and work performed in accordance with the RAW.

1.2.4 MKM Engineers, Inc.

MKM is responsible for obtaining a RC at FTIR-38 and FTIR-40. Mr. Srini Neralla, Ph.D. is MKM's Project Manager for this project and, as such, is responsible for the overall coordination, budget, schedule, and performance of work. He will be MKM's primary point of contact with the Army and Fort Irwin to insure that work meets the technical requirements. Ms. Peggy Llewellyn, P.E. is the Quality Control Manager for this project and is responsible for the technical quality and compliance with regulatory requirements and obtaining regulatory approval for completion of this work. Ms. Llewellyn is a California Licensed Professional Civil Engineer and will be responsible for the preparation of documents, assisting Fort Irwin's RPM in technical discussions with the regulators, ensuring that field work is performed in accordance with the approved plans, resolving technical issues, and coordinating quality control and review with the USACE.



2.0 Site Background

The following section will provide a brief description, history, and summary of previous investigations of the sites that will be address through the implementation of this RAW.

2.1 Site History

Fort Irwin was originally established in 1940 as the Mojave Anti-Aircraft Range to provide a range where training in the use of anti-aircraft weapons could be conducted without interruption. The California Institute of Technology also used the area around Goldstone Dry Lake for rocket testing. In 1972, the California National Guard assumed operation of the installation. The U.S. Army was reissued command of the facility in 1981 and Fort Irwin became part of the National Training Center (NTC) for the Army. The NTC has been operated by the Department of Defense (DoD) since 1981 and is used for training operations in mid-to high-intensity combat scenarios, as well as providing troop housing and military support.

2.2 Site Description

Fort Irwin encompasses approximately 1,000 square miles of the Mojave Desert in San Bernardino County, California. The community of Barstow, California is located approximately 35 miles southwest of the installation (**Figure 2-1**). The Goldstone Dry Lake Playa is located in the west-central portion of the Fort Irwin Installation. FTIR-38 and FTIR-40 are located near the Goldstone Dry Lake Playa. (**Figure 2-2**)

FTIR-38 is known as the Goldstone Lake Mortar and Small Arms Range, and is located in the east-central portion of the Goldstone Dry Lake Playa (**Figure 2-3**). The site is divided into two major subsites – Area 1 and Area 2. Site FTIR-38 Area 1 is not included in this project.

FTIR-38 Area 2 consists of a series of 18 soil embankments on the dry lake bed that were apparently used as backstops for target practice. Spent rounds of 20 mm and 50-caliber slugs were found throughout these soil embankments. Wooden debris and posts are in front of several embankments. These posts may have been used to hold the target cloth for airplane target practice.

FTIR-40 is known as the Mojave Anti-Aircraft Range and is located on the eastern edge of low hills and on the western edge of the Goldstone Dry Lake alluvial basin (**Figure 2-4**). FTIR-40 is approximately 4 miles southwest of FTIR-38. The site has been divided into two subsites – Area 1 and Area 2. Area 1 has been further divided into Area 1.1 and Area 1.2.

FTIR-40 Area 1 consists of a small wash containing discarded metal debris and military rounds in the two Sub-Areas, 1.1 and 1.2. A soil mound with municipal waste debris and artillery shells is located within Sub-Area 1.1. A small amount of miscellaneous debris (e.g., metal and asphalt) is scattered throughout Sub-Area 1.2.

FTIR-40 Area 2 is located downstream of Sub-Area 1.1 on an alluvial fan just east of the point where the wash emerges into the alluvial fan. The remnants of a former military outpost, consisting of several concrete foundations, exist at the site. FTIR-40 Area 2 is not included in this project.



2.3 Site Geology and Hydrogeology

Fort Irwin is located within the Mojave Desert, characterized by range-and-basin geology. The Mojave has a typical range-and-basin topography with sparse vegetation. Erosion from seasonal rains deposits sand and gravel into alluvial fans that eventually drain to central salt flats (Montgomery Watson Harza [MWH], 2003).

FTIR-38 is located on the edge of Gladstone Dry Lake Playa which is located to the north on the edge of the alluvial fan formed by the erosion of the Granite Mountains. The geology at FTIR-38 is characterized by fine-grained, lacustrine sediments. Geotechnical samples taken from this area indicate that the surface and near surface soils at the site consist of silty and sandy clays. The thickness of the alluvium soils and sediments at this site is unknown, but these sediments are expected to extend several hundred feet deep as indicated by logs of wells drilled in the vicinity by Parsons ES in 1995. Because of the low permeability of sediments in the Gladstone Dry Lake Playa, precipitation and run-on from the surrounding areas accumulate in the Gladstone Dry Lake Playa until this ponding evaporates (MWH, 2003).

Site FTIR-40 Area 1 is located in a small, eastward draining wash, and FTIR-40 Area 2 is located on an alluvial fan immediately west of a gully mouth. The geology of both areas is characterized by medium to coarse grain alluvial sediments. Geotechnical samples taken from this area indicate that the surface and near surface soil is silty sand with gravel. Surface water from this area flows toward Gladstone Dry Lake Playa (MWH, 2003).

Two inactive wells in the Goldstone area provide hydrogeologic information. Static water levels in these wells were measured at 170 feet below ground surface in 1943. In 1998, Goldstone Well A was abandoned to a depth of 176 feet and no groundwater was encountered (MWH, 2003).

2.4 Climate

Fort Irwin is located within the Mojave Desert, directly south of the Death Valley National Park. The Mojave Desert is found at elevations of 2,000 to 5,000 feet, and is considered a "high desert." It is a transition desert between the hot Sonora Desert to the south, and the cold Great Basin Desert to the north. The climate of the Mojave Desert has extreme fluctuations of daily temperatures, strong seasonal winds, and clear skies. **Table 2-1** on the following page provides basic weather data for Barstow, California, from 1960 to 1999.

Temperatures in this region have been as low as 8°F in January, and as high as 119°F in August. In May, the temperature will begin to climb in excess of 100°F and continue into October. The night temperatures in July and August can at times be in the low to mid 90s.

In late winter and early spring the wind is a prominent feature, with dry winds blowing in the afternoon and evening. Winds in excess of 25 mph, with gusts of 75 mph or more, are not uncommon. Although it is windy during all months, the calmest months are November, December, and January. The humidity is below 40% most of the year. During most winter nights, and during and after summer rains, the humidity can rise above 50%.

The Mojave Desert lies in the rain shadow of the Coast Ranges and receives an average annual precipitation of 5 inches. Most of the rain falls between November and April. There is,



SECTION 2.0 – SITE BACKGROUND

however, a summer thunderstorm season from July to September with violent and heavy rainstorms possible. In 1986, only 1.5 inches of rain fell on the Eastern Mojave Desert, while in 1983 6.5 inches came down. May and June are usually the driest months. During cycles of El Niño, as experienced in recent years, more rain falls on the Mojave Desert than usual. The runoff has resulted in shallow ponds in the normally dry washes and playas.

According to the U.S. Geological Survey, vegetation has grown denser since the early 1970s, most likely due to the increased precipitation. The Survey's conclusion is that the climate of the Mojave Desert has not been static, and has experienced many changes in the past century. Ongoing research suggests that the recent climate variation has influenced the landscape, plants, and animals of the desert ecosystem.

Table 2-1. Weather Data for Barstow, California from 1960 to 1999.

Month	Average Maximum Temperature (°F)	Average Minimum Temperature (°F)	Average Precipitation (Inches)
January	60.8	31.6	0.56
February	65.5	35.3	0.64
March	70.1	39.4	0.49
April	76.4	44.1	0.21
May	86.0	52.2	0.12
June	95.6	60.3	0.09
July	102.1	66.6	0.18
August	99.8	65.2	0.41
September	93.2	58.0	0.29
October	82.7	47.9	0.15
November	66.6	36.4	0.43
December	59.8	30.5	0.48
ANNUAL	80.1	47.4	4.06

2.5 Flora and Fauna

Reflective of the Mojave Desert, the flora and fauna are a diverse mixture resulting from many microhabitats. Typical plants include creosote bush (*Larrea divaricata*), Spanish bayonet (*Yucca whipplei*), Kern Joshua tree (*Yucca brevifolia*), California juniper (*Juniperus callifornicus*), and a variety of chollas, barrel, and prickly pear type cacti.

A majority of the fauna found in the Mojave Desert extends into the Sonoran or Great Basin Deserts, as well. However, the following avifauna and herpetofauna are characteristic of the Mojave region in particular: LeConte's thrasher (*Toxostoma lecontei*), banded gecko (*Coleonyx variegatus*), desert iguana (*Dipsosaurus dorsalis*), chuckwalla (*Sauromalus obesus*), and regal horned lizard (*Phrynosoma solare*). Snake species include the desert rosy boa (*Lichanura trivirgata gracia*), Mojave patchnose snake (*Salvadora hexalepis mojavensis*), and Mojave



rattlesnake (*Crotalus scutulatus*) (Brown 1994). Other endemic fauna include the Mojave ground squirrel (*Spermophilus Mojavensis*) and Amargosa vole (*Microtus californicus scirpensis*).

The native range of California's threatened desert tortoise (*Gopherus agassizii*) includes the Mojave and Colorado Deserts. The desert tortoise has adapted for desert existence by storing up to a liter of water in its urinary bladder. The tortoise feeds on ephemeral plants in the spring and accumulates enough reserves of water to carry it through the remainder of the year.

Ecological habitat surveys were conducted at FTIR-38 and FTIR-40. No significant ecological habitats exist at FTIR-38 Area 1. However, at FTIR-38 Area 2, FTIR-40 Area 1.1, and FTIR-40 Area 2, some potential habitats were identified for the Mojave ground squirrel, burrowing owls, and other consumer species. FTIR-40 Area 1.1 and FTIR-40 Area 2 were identified as a potential habitat for the desert tortoise based on plants identified in the area, but due to the small area of these sites, these areas represent a very small portion (less than 1-percent) of the desert tortoise's home range. In the Spring of 2005, Fort Irwin Environmental Personnel identified Mojave ground squirrels in the area of FTIR-38, Area 2. In June 2005, Fort Irwin Environmental Personnel identified burrowing owl burrows and four burrowing owls at one berm location at FTIR-38 Area 2.

2.6 Archaeological History

Some areas at Fort Irwin are considered to be sites of archaeological importance. Specifically, a few locations at FTIR 38 were found to contain 'rock flakes' of archaeological importance. These locations have been flagged by the Army and will be fenced to avoid accidental or unintentional running over of vehicles during the implementation of the work plan.

2.7 Previous Investigations

In 1997, MWH conducted a site investigation (SI) of seven sites at Fort Irwin, including FTIR-38 and FTIR-40. The data collected during the SI was evaluated for human health and ecological risks in a screening level Human Health Risk Assessment (HHRA) (MWH, 1998) and Ecological Risk Assessment (ERA) (MWH, 1998).

In 2003, a Remedial Investigation (RI) was conducted at sites that were found to have a potential risk to human health or the environment based on the HHRA and ERA, including FTIR-38 and FTIR-40. RI data was evaluated in a Phase II Ecological Validation Study (MWH, 2003); sites and/or Areas within sites which had a potential ecological risk were retained for further evaluation in the Feasibility Study (FS) (MWH, 2003).

2.7.1 FTIR-38

Based on the past use of FTIR-38 as a firing range, the SI and RI focused on chemical contaminants typically found at firing ranges, including metals and degradation products associated with explosive compounds. During the SI, surface soil samples were collected within the 55-gallon drum circle at FTIR-38 Area 1 and analyzed for metals, nitroaromatics/nitroamines, nitrogen-ammonia, nitrate/nitrite, and nitroglycerin. Surface samples were also collected from the four most visually contaminated berms in the FTIR-38 Area 2 and were analyzed for metals. The screening level HHRA and ERA indicated that



concentrations of several metals at FTIR-38 exceeded risk based screening levels and the site was retained as a RI site.

At FTIR-38 Area 1, subsurface soil samples were collected during the RI to determine the vertical extent of metal contamination at the site. Due to the lack of vegetation at FTIR-38 Area 1, no plant tissue samples were collected at this location. Based on sample results, and due to the lack of significant ecological habitat and no complete ecological pathway, FTIR-38 Area 1 was not retained as an Area of Concern (AOC) in the FS.

The RI activities at FTIR-38 Area 2 consisted of collecting plant tissue and surface soil samples, and performing X-Ray fluorescence sampling for lead. Lead concentrations exceeding 1,000 milligrams per kilogram (mg/kg) were detected in three of the southwest soil berms in this Area. Concentrations were the highest in the upper six inches of soil and decreased laterally from the center of the berm and with depth. Based on the evaluation presented in the Phase II Ecology Validation Study, lead and aluminum were identified as potential chemicals of ecological concern (COECs), and FTIR-38 Area 2 was retained as an AOC in the FS (**Figure 2-3**).

2.7.2 FTIR-40

During the SI at FTIR-40, surface soil samples were collected near piles of metal debris at Sub-Areas 1.1 and 1.2. Soil samples were taken from a test pit excavated within the center of a large debris pile at Sub-Area 1.1. These samples were analyzed for total recoverable petroleum total recoverable petroleum hydrocarbons (TRPH), metals, nitroaromatics/nitroamines, nitrogen-ammonia, nitrate/nitrite, and nitroglycerin. Soil sample results were compared to background concentrations for the site (MWH, 1997) and chemicals exceeding background levels included:

- Arsenic, barium, cadmium, calcium, copper, iron, lead, manganese, nitrate/nitrite, and zinc from the test pit in Sub-Area 1.1;
- TRPH was detected in several samples in Sub-Area 1.1, with a maximum concentration of 180 mg/kg; and
- Lead and manganese were detected at concentrations slightly above the background levels in Sub-Area 1.2.

At Area 2, a test pit was excavated to investigate a septic tank, and soil samples were collected from below and around the septic tank and analyzed for metals, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and TRPH. Several SVOCs were detected at concentrations below the U.S. Environmental Protection Agency (USEPA) preliminary remediation goals. VOCs were not detected in any of the samples.

Based on the HHRA and ERA, further investigation was needed at the Sub-Area 1.1 and Area 2. Plant tissue samples and surface samples were collected in Sub-Area 1.1 during the RI. At Area 2, RI activities consisted of:

- Collecting plant tissue samples;
- Collecting surface samples;
- Collecting subsurface samples in the area of the septic tank and suspected leach field associated with the septic tank; and



SECTION 2.0 – SITE BACKGROUND

- Abandoning Goldstone Well A by pressure grouting.

A Phase II Ecological Validation Study was conducted for FTIR-40 Sub-Area 1.1 and Area 2, which indicated that cadmium, copper, lead, and zinc were potential COECs at Sub-Area 1.1. As a result, FTIR-40 Sub-Area 1.1 was retained as an AOC in the FS. The potential contaminants of concern (COCs) were further refined in the FS, and COECs were developed. Zinc and cadmium were eliminated during this evaluation, leaving copper and lead as the COECs at Sub-Area 1.1 (**Figure 2-4**).

At FTIR-40 Area 2, the Phase II Ecological Validation Study demonstrated that concentrations of potential COCs did not pose an unacceptable ecological risk and this area was not retained as an AOC in the FS.



3.0 Removal Action Goals and Alternatives

The following section summarizes the goals to be achieved by the removal actions at FTIR-38 Area 2 and FTIR-40 Area 1 and the alternative removal measures that were considered in the FS (MWH, 2003) to achieve those goals. This section also discusses and incorporates regulatory agency comments on the cleanup goals and the assumptions that were used to develop the cleanup goals in the FS (MWH, 2003) to the extent that the regulatory agencies disagreed with the numbers developed in the FS.

3.1 Removal Action Goals

The removal action goals for FTIR-38 and FTIR-40 follow USEPA Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) guidance and include:

- Protecting human health and the environment.
- Complying with applicable or relevant and appropriate regulations (ARARs).

The HHRA, ERA, and Phase II Ecological Validation Study evaluated the contaminants identified on site and potential exposure pathways to determine if the existing site conditions were protective of human health and the environment. The risk assessments identified that several exposure pathways, such as, consuming plants and direct contact with impacted soil, existed for the Mojave ground squirrel. Therefore, risk-based concentrations were calculated for the potential COCs in the soil that are protective of the Mojave ground squirrel. These risk-based concentrations were developed using formulae provided in USEPA guidance for Ecological Risk Assessments. After publication of the final RI/FS (MWH, 2003), the California Department of Fish and Game (DFG) reviewed in detail the ecological risk assessment and the assumptions that were used in the development of the cleanup goals, in particular the development of the cleanup goals, for lead. The DFG disagreed with a number of the assumptions used in the development of the cleanup goals in ecological risk assessment in the RI/FS (MWH, 2003).

Based on agency concerns with the assumptions used in the ecological risk assessment presented in RI/FS (MWH, 2003), a stakeholders group of toxicologists, resource managers and risk managers from the DTSC, DFG, Army, and MKM met to discuss the assumptions and a path forward. **Appendix G** includes the site specific recalculated cleanup goal for lead in soil at FTIR-38 and FTIR-40 based on consensus from the group. On June 8, 2005 DFG requested that a biological survey of wildlife be conducted at FTIR-38 Area 2 and FTIR-40 Area 1.1. A wildlife survey was conducted on June 9-10, 2005. Results of the survey confirmed the presence of burrowing owls on one berm at FTIR-38 Area2. No other special status species were observed. A mitigation plan for the burrowing owls was drafted and accepted by DFG and DTSC. The survey reports, meeting minutes from conference calls discussing mitigation measures for the burrowing owl, and the burrowing owl mitigation plan are presented in **Appendix H**.

These concentrations were then compared to sample results from the various sites. Laboratory results from soil samples collected in FTIR-38 Area 2 and FTIR-40 Area 1.1 exceeded these



risk-based concentrations for several COCs. The risk based concentrations for the specific COCs are presented in Table 3-1.

Table 3-1. Site Specific Cleanup Levels for FTIR-38 and FTIR-40 National Training Center, Fort Irwin, California.

Site	Medium	Chemical of Concern	Site Specific Cleanup Level (milligrams per kilogram)
FTIR-38	Soil to cleanup goals	Aluminum	23,600
		Lead	290
FTIR-40	Soil to cleanup goals	Copper	10,900
		Lead	290

Reference: Remedial Investigation/Feasibility Study FTIR-38 and FTIR-40, Fort Irwin National Training Center, February 2003, MWH

Stakeholder meeting April 5, 2005, Cypress California, Stakeholder meeting April 7, 2005, Sacramento, California

The specific goals of the response actions for FTIR-38 and FTIR-40 are to:

- Eliminate COC exposure pathways to humans and ecological receptors (i.e. Mojave ground squirrel and Burrowing Owls) associated with exceeding site specific risk-based clean-up levels at hot spots in the berm locations shown on **Figure 3-1** at FTIR-38 Area 2.
- Eliminate the exposure pathways to ecological receptors associated with COCs exceeding site specific risk-based clean-up levels at one hot spot location shown on **Figure 3-2** at FTIR-40 Sub-Area 1.1.

3.2 Response Action Alternatives

The FS (MWH, 2003) evaluated response action alternatives in accordance with the nine CERCLA evaluation criteria, including protection of human health and the environment, compliance with ARARs, implementability, short and long-term effectiveness, reduction in toxicity, mobility or volume, and cost.

For Site FTIR-38 Area 2, the following response actions were evaluated:

- No action (Alternative 1)
- Institutional controls (Alternative 2)
- Limited soil removal and disposal, backfilling with clean fill material, and institutional controls (Alternative 3)

A detailed analysis of clean closure was not developed in the FS for FTIR-38 because a clean closure would have required an extensive removal action resulting in habitat destruction over an extensive area.



SECTION 3.0 – SITE SPECIFIC WORK PLAN

The “no action” and “institutional controls” alternatives are protective of human health under the current (casual visitor) and most probable future (industrial worker) land use scenarios. However, the “no action” alternative does not meet ARARs or the remedial action goals to be protective of ecological receptors. The institutional controls alternative meet ARARs, but would not achieve the remedial action of goals of being protective of ecological receptors such as the Mojave ground squirrel, since it would be virtually impossible to enforce institutional controls (such as fences with warning signs or deed restrictions) on a native burrowing species. The third alternative, limited soil removal and disposal, meets the intent of ARARs and would achieve the remedial action objectives and is easily implementable and effective. Based on the discovery of burrowing owls at FTIR-38 Area 2, DFG requested that MKM flatten the berms to grade after removal of the contaminated soil. DFG was concerned that the site specific lead cleanup goal of 290 mg/kg would not be protective of burrowing owls and wanted to discourage them from living in the impacted area. A mitigation plan was drafted for the burrowing owls which includes setting aside new habitat for the burrowing owls and relocating them to the new habitat prior to the implementation of the removal action. This alternative also includes access and land use restrictions since soils impacted with lead and aluminum will be left in place. Access restrictions include site security and installation of warning signs. Land use restrictions have been developed and are enforced by the planning group at Fort Irwin through the use of a Master Plan. Currently there are no future plans for further use of Site FTIR-38. If ownership of the base is transferred to private or non-federal entities, the DoD would establish land use restrictions to maintain this area for industrial use only.

For FTIR-40 Sub-Area 1.1, the following response actions were evaluated:

- No action (Alternative 1)
- Institutional controls (Alternative 2)
- Surface debris removal with institutional controls (Alternative 3)
- Surface debris removal with limited soil removal to a depth of 3.5 feet (to account for the burrowing depth of the Mojave ground squirrel) and disposal, backfilling, and institutional controls (Alternative 4)
- Clean closure (Alternative 5)

The “no action” and “institutional controls” alternatives are protective of human health under the current (casual visitor) and most probable future (industrial worker) land use scenarios. However, the “no action” alternative does not meet ARARs or the remedial action goals. The two institutional controls alternatives (Alternatives 2 and 3) meet ARARs, but would not achieve the remedial action goal of eliminating exposure pathways for the Mojave ground squirrel, since it would be virtually impossible to enforce institutional controls (such as fences or deed restrictions) on a native burrowing species. Alternatives 4 and 5 both meet the intent of ARARs and achieve the remedial action goals. However, Alternative 4 was selected because it is protective of human health and ecological receptors, under current and future land use scenarios, meets the intent of ARARs, achieves the remedial action objects, and is more cost effective than Alternative 5. Alternative 4 includes access and land use restrictions since soils impacted with lead and copper will be left in place. Based on comments from DFG dated January 14, 2005, the hot spot areas identified in Figure 3-3 will be excavated to the cleanup



goals. Access restrictions include site security and installation of warning signs. Land use restrictions have been developed and are enforced by the planning group at Fort Irwin through the use of a Master Plan. Currently there are no future plans for further use of Site FTIR-38. If ownership of the base is transferred to private or non-federal entities, land use restrictions would be established to maintain this area for industrial use only.

3.3 Removal Action Activities

Based on the evaluation in the FS, the removal action Activities for Sites FTIR-38 and FTIR-40 are:

- Excavate and dispose of soil from 34 sample locations at FTIR-38 Area 2, based on the samples from the RI/FS exceeding cleanup goals and as developed in **Table 3-2, and shown in Figures 3-1 and 3-2**. Collect and analyze confirmation samples to verify that clean-up levels for the COCs have been achieved. After the removal of contaminated soils exceeding the site specific cleanup levels (**Table 3-1**), all remaining berm structures at FTIR-38 will be flattened to grade.
- Remove debris from FTIR-40 Sub-Area 1.1
- Excavate and dispose of soil from two locations at FTIR-40 Area 1.1 to cleanup goals. Collect and analyze confirmation samples to verify that clean-up levels for the COCs have been achieved.
- Backfill the excavation in FTIR-40 Sub-Area 1.1 with clean soil to provide a clean soil cover over the area.

Table 3-2. Areas where Soil exceeds the Cleanup Goals for FTIR-38 and FTIR-40 National Training Center, Fort Irwin, California

Site	Berm or Hotspot	RI/FS Sample Location	Depth of sample(s) exceeding Cleanup Goals In Feet below ground surface	Concentration and Compound Exceeding Cleanup Goals in milligrams per kilogram
FTIR-38 Area 2	B-1	38-2-B1-SS-1	0	1,280 lead
		38-2-B1-SS-3	0	406 lead
		38-2-SS-28	0/ 1	640 lead /1,200 lead
		38-2-SS-54	0/ 1	490 lead /2,000 lead
	B-2	38-2-B2-SS-1	0	2,020 lead
		38-2-B2-SS-3	0	298 lead
		38-2-SS-27	0/ 1	1,700 lead/1,700 lead
		38-2-SS-53	0/1/2	730 lead /2,500 lead/510 lead
	B-3	38-2-B3-SS-1	0	2,440 lead
		38-2-B3-SS-3	0	1,110 lead
		38-2-SS-26	0/ 1	930 lead/5,200 lead
		38-2-SS-52	0/ 1	800 lead /340 lead
	B-4	38-2-B4-SS-1	0	6,430 lead
		38-2-B4-SS-2	0	635 lead/ 25,600 Aluminum
		38-2-B4-SS-3	0	890 lead
		38-2-SS-11	0/1	600 lead/1,700 lead
		38-2-SS-37	0/1/3	2,100 lead /580 lead/320 lead



SECTION 3.0 – SITE SPECIFIC WORK PLAN

Site	Berm or Hotspot	RI/FS Sample Location	Depth of sample(s) exceeding Cleanup Goals In Feet below ground surface	Concentration and Compound Exceeding Cleanup Goals in milligrams per kilogram
FTIR-38 Area 2	B-5	38-2-SS-14 38-2-SS-40	0 0	1,400 lead 1,200 lead
	B-6	38-2-SS-13 38-2-SS-39	0 0/1	720 lead 1,900 lead /670 lead
	B-7	38-2-SS-12 38-2-SS-38	0/1 0/1	1,000 lead/1,300 lead 2,500 lead /710 lead
	B-8	38-2-SS-25	0/1	420 lead/940lead
FTIR-38 Area 2 FTIR-38 Area 2	B-9	38-2-SS-24 38-2-SS-50	1 2	900 lead 460lead
	B-10	38-2-SS-23 38-2-SS-49 38-2-SS-191	1 0 0	390 lead 320 lead 370 lead
	A	38-2-SS-112	0	300 lead
	B	38-2-SS-212	0	410 lead
	C	38-2-SS-3/99 Duplicate	0	31,700 Aluminum / 23,900 Aluminum
	D	38-2-SS-2	0	33,100 Aluminum
FTIR-40 Area 1.1	Area F	40-1-SS-1 40-1-SS-2	0 0	10,800 lead /12,900 Copper 38,400 lead

3.4 Compliance with ARARs

An ARAR evaluation was conducted in the FS. This evaluation looked at regulations and requirements that were applicable to the various remedial alternatives to determine if the alternatives complied with ARARs. ARARs are typically grouped into three major categories, which are:

1. Chemical specific
2. Location specific, and
3. Action specific.

The ARARs evaluated and identified in the FS for the selected alternative have been incorporated into the development and planning of the removal action activities.



3.4.1 Chemical Specific ARARs

The chemical specific ARARs included various guidance documents to be considered from the USEPA, DTSC, and USACE guidance documents that were used in the development of the Cleanup Goals in **Table 3-1**.

3.4.2 Location Specific ARARs

The Location Specific ARARs that were determined to be applicable for FTIR-38 and FTIR-40 in the FS included:

- Endangered Species Act 16 U.S. Code 1531, which protects federally proposed and listed threatened or endangered animals and species and their habitats. FTIR-38 and FTIR-40 provide potential habitat for the desert tortoise, a federally listed endangered species.
- California Endangered Species Act of 1984 and California Native Plant Protection Act, California Fish and Game Code, Chapter 15, Article 15, paragraphs 1900-1913 and 2050 -2098, which provides protection to rare, threatened or endangered plant, fish, and wildlife species and their habitats. FTIR-38 and FTIR-40 provide potential habitat to the Mojave ground squirrel (a state-listed threatened species) and the desert tortoise (a state and federally listed endangered species).

The purpose of this project is to reduce or eliminate the exposure pathway of COCs to the Mojave ground squirrel and the burrowing owls through the removal of contaminated soil within the burrowing zone at FTIR-38 and FTIR-40 and flattening all remaining berm structures (FTIR-38) to grade. In the interest of protecting the Mojave ground squirrel and the burrowing owls, disruption of habitat will be required. MKM will use the following best management practices during the excavation of contaminated soil to protect the Mojave ground squirrel and the burrowing owls:

- Evaluate the potential habitat at the site prior to site mobilization;
- Delineate and protect potential habitat areas as feasible. Please see **Appendix H** for mitigation measures for both the Mohave ground squirrel and the burrowing owls; and
- Notify U.S. Fish and Wildlife and California Department of Fish and Game, Habitat Conservation Branch if potential habitat is destroyed.

The U.S. Federal Solid Waste Disposal Act and the Porter-Cologne Water Quality Control Act, Waste Management Units, Classification and Siting regulations were identified as potentially applicable location specific ARARs in the FS if the site remedy included onsite disposal of wastes. Since the proposed remedy will include off-site disposal of wastes in a permitted landfill and does not involve the construction of an on-site landfill for the disposal of wastes, these location specific ARARs are not applicable to the selected site remedy.

3.4.3 Action Specific ARARs

The action specific ARARs for the removal action activities include a variety of federal regulations including the Federal Clean Air Act, the Federal Clean Water Act, the Resource Conservation and Recovery Act, California Regulations including the California Hazardous Waste Control Laws, the California Clean Air Act, the California Water Code, and the Porter-



SECTION 3.0 – SITE SPECIFIC WORK PLAN

Cologne Water Quality Control Act. These regulations govern issues such as storm water control, dust control, hazardous waste characterization, manifesting, transportation, and disposal. **Table 3-3** summarizes these requirements.



SECTION 3.0 – SITE SPECIFIC WORK PLAN

Table 3-3. Applicable and Relevant Regulations (ARARs)

Source or Authority	Regulation, Standard or Criteria	Potential Type	Description	Measures to achieve Compliance
Federal Clean Water Act and California Water Code	40 Code of Federal Regulations (CFR)122-124 USEPA Administered Permit Programs Order 92-08-DWQ	Relevant if site is less than 5 acres	Requirements to ensure storm water discharges from remedial actions do not contribute to a violation of surface water quality standards.	Take measures such as construction of secondary containment of fueling areas and stockpiles, and construction of silt fences to prevent discharges of sediment during storm event. Conduct field work in dry season.
Clean Air Act and California Clean Air Act	40 CFR 50 NAAQS CAC Section 109	Applicable	Establishes emission limits for specific compounds including lead.	Use dust control measures such as covering trucks before they leave the site, and wetting access routes and areas where dust is generated. Perform air monitoring to verify lead emission levels.
	Mojave Desert AQMD Rule	Applicable	Regulates PM 10 dust emissions, including sources to reduce track-out to paved surfaces.	To the extent possible paved surfaces will be used, minimum practical distances will be used for unpaved routes; vehicles will be decontaminated before entering paved surface. Cover loaded vehicles
	Mojave Desert AQMD	Applicable	Establishes requirements for permits for screening equipment and other off-road equipment.	Obtain and comply with permits from AQMD for remediation activities.
Resource Conservation and Recovery Act and California Hazardous Waste Control Law	40 CFR 261 22 CRF Division 4.5 Chap11	Applicable	Identification and listing of hazardous waste, defines solid wastes that are subject to regulation as listed and characteristic hazardous waste.	Since soil from site is not a listed process, collect samples to determine if waste is a characteristic hazardous waste.
	40 CFR 262 22 CRF Division 4.5 Chap12	Applicable	Establishes requirements for generators of hazardous waste including waste classification, packaging, labeling, accumulation time and transport.	Follow requirements established by this regulation for classification, packaging, labeling and transport of soils that are characteristic hazardous waste.
	40 CFR 264 22 CRF Division 4.5 Chap14 and Article 9 22 CCR 66264.170 through 66264.179	Applicable	Establishes requirements for storage and treatment or disposal of hazardous waste including the 90-day storage rule and condition of containers. California regulations establish additional requirements for licensed hazardous waste transporters and containers.	All soil will be loaded directly into trucks for disposal to a permitted TSD so that TSD rules will not apply onsite, but will be applicable for the selected disposal site.
	40 CFR 268 Article 1 and Article 3 22CFR 66268.9 22CFR 66268.35	Applicable	Establishes Land Disposal Restrictions (LDR) and treatment standards for wastes that exceed LDRs. California regulations identify additional compounds and more restrictive levels than federal regulations.	Soil will be screened to remove lead slugs from soil to reduce lead concentration in soil and recycle lead slugs. If concentrations of lead after screening exceed LDRs, soil will be stabilized at the TSD prior to disposal.
Location Specific ARARs California Department of Fish and Game	Fish and Game Code section 5650 (a), (b) & (f)	Applicable	Prohibits depositing or placing where it can pass into waters of the state any petroleum products (Section 5650(a)(1)), factory refuse (section 5650(a)(4)), sawdust, shavings, slabs or edgings (section 5650(a)(3)), and any substance deleterious to fish, plant life or bird life (section 5650(a)(6)). These are substantive, promulgated environmental protection requirements.	Take measures such as construction of secondary containment of fueling areas and stockpiles, and construction of silt fences to prevent discharges of sediment during storm event. Conduct field work in dry season.
	Fish and Game Code section 3005 (Stats. 1957, c. 456, p. 1353 section 3005)	Applicable	This code section prohibits the taking of birds and mammals, including taking by poison. A Take is defined by Fish and Game Code section 86 to include killing. A Poison is not defined in the code. (Defenders of Wildlife v. Administrator, Environmental Protection Agency (1989) 882 F. 2d. 1295). This code section imposes a substantive, promulgated environmental protection requirement.	Action must be taken to prohibit the taking of birds and mammals, including the taking by poison



SECTION 3.0 – SITE SPECIFIC WORK PLAN

Source or Authority	Regulation, Standard or Criteria	Potential Type	Description	Measures to achieve Compliance
Location Specific ARARs California Department of Fish and Game	Fish and Game Code section 1908 (Added by Stats. 1977, c. 1181, p. 3869, section 8)	Applicable	Section 1908 imposes a substantive requirement by forbidding any "person" to take rare or endangered native plants. California Code of Regulations Title 14 section 670.2 provides a listing of the plants of California that have been declared to be Endangered, Threatened or Rare. Fish and Game Code section 67 provides the definition of A person as any natural person or any partnership, corporation, limited liability company, trust, or other type of association.	Action must be taken to conserve native plants, there can be no releases and/or actions that would have a deleterious effect on species or habitat.
	Fish and Game Code section 3511 (Added by Stats. 1970, c. 1036, p. 1848 section 4)	Applicable	This section provides that it is unlawful to take or possess any of the following fully protected birds: (a). American peregrine falcon (b). Brown pelican (c). California black rail (d). California clapper rail (e). California condor (f). California least tern (g). Golden eagle (h). Greater sandhill crane (i). Light-footed clapper rail (j). Southern bald eagle (k). Trumpeter swan (l). White-tailed kite (m). Yuma clapper rail	Fort Irwin is within known range of the golden eagle. Action must be taken to prevent the taking of fully protected birds
	Fish and Game Commission Wetlands Policy (adopted 1987) included in Fish and Game Code Addenda Wetlands	To Be Considered	This policy seeks to provide for the protection, preservation, restoration, enhancement and expansion of wetland habitat in California. Further, it opposes any development or conversion of wetland that would result in a reduction of wetland acreage or habitat value. It adopts the USFWS definition of a wetland which utilizes hydric soils, saturation or inundation, and vegetable criteria, and requires the presence of at least one of these criteria (rather than all three) in order to classify an area as a wetland.	Site is on the edge of a dry lake. Actions must be taken to assure that there is "no net loss" of wetlands acreage or habitat value. Action must be taken to preserve, protect, restore and enhance California's wetland acreage and habitat values.
	Fish and Game Code section 4700 (Added by Stats. 1970, c. 1036, p. 1848 section 6) Fully-protected mammals	Applicable	This section prohibits the take or possession of any of the fully protected mammals or their parts. The following are fully protected mammals: (a) Morro Bay kangaroo rat (b) Bighorn sheep except Nelson bighorn sheep (c) Northern elephant seal (d) Guadalupe fur seal (e) Ring-tailed cat (f) Pacific right whale (g) Salt-marsh harvest mouse (h) Southern sea otter (i) Wolverine	This section is applicable, relevant, and appropriate to the extent that such mammals and/or their habitat are located on or near the sites. The known range of ring-tailed cat includes Ft. Irwin. Actions must be taken to assure that no fully protected mammals are taken or possessed at any time.
	Fish and Game Code section 3503, 3503.5 (added by Stats. 1985, c. 1134, section 6), and 3800 (added by Stats. 1971, c. 1470, p. 2906 section 13) Birds, Birds of Prey, Non-Game birds	Applicable (section 3503 and 3503.5) Section 3800 To be Considered (not a mining operation)	Sections 3503 and 3503.5 prohibits the take, possession, or needless destruction of the nest or eggs of any bird including birds of prey, except as otherwise provided by this code or any regulation made pursuant thereto. Section 3800 prohibits the take of non-game birds, except in accordance with regulations of the commission, or when related to mining operations with a mitigation plan approved by the department.	Action must be taken to avoid the take or destruction of the nest or eggs of any bird
	Fish and Game Code section 4000, et. Seq. (Stats. 1957, c. 456, p. 1380, section 4000) Fur-bearing Animals	Applicable	This section provides that a fur-bearing mammal may be taken only with a trap, a firearm, bow and arrow, poison under a proper permit, or with the use of dogs.	Provides manners under which fur-bearing mammals may be taken
	Fish and Game Code section 4150 (Added by Stats. 1971, c. 1470, p. 2907, section 21) Non-Game Animals	Applicable	Non-game mammals are those occurring naturally in California which are not game mammals, fully protected mammals, or fur-bearing mammals. These mammals, or their parts, may not be taken or possessed except as provided in this code or in accordance with regulations adopted by the commission.	Action must be taken to avoid the take or possession of nongame mammals
	Fish and Game Code sections 4800 et seq. (Prop. 117 approved June 5, 1990)	Applicable	Mountain lions are specially protected mammals in California. It is unlawful to take, injure, possess, transport, or sell any mountain lion or any part or product thereof. Violation of this section is a misdemeanor.	Mountain lions are known to occur at Fort Irwin. Action must be taken to avoid injuring, taking, possessing or transporting any mountain lion



SECTION 3.0 – SITE SPECIFIC WORK PLAN

	Mountain Lions			
Source or Authority	Regulation, Standard or Criteria	Potential Type	Description	Measures to achieve Compliance
Location Specific ARARs California Department of Fish and Game	Fish and Game Code sections 5000 et. Seq. (Stats. 1957, c. 456, p. 1393, section 5000) Desert Tortoises	Applicable	This section makes it unlawful to sell, purchase, harm, take, possess, or transport any tortoise or parts thereof, or to shoot any projectile at a tortoise. This does not apply to the taking of any tortoise when authorized by the department for education, scientific, or public zoological purposes.	Desert tortoises have potential to occur at Sites FTIR-38 and FTIR-40. Action must be taken to avoid the sell, purchase, harm, take or possession of desert tortoises.
Location Specific ARARs California Department of Fish and Game	Title 14 C.C.R. sections 40 (Section 40 designated effective 03/01/74) Protected reptiles and amphibians	Applicable	This regulation makes it unlawful to capture, collect, intentionally kill or injure, possess, purchase, propagate, sell, transport, import, or export any native reptile or amphibian, or parts thereof unless under special permit from the department issued pursuant to Title 14 C.C.R. sections 650, 670.7, or 783 of these regulations, or as otherwise provided in the Fish and Game Code or these regulations.	Action must be taken to avoid the take or possession of protected reptiles and amphibians
	Title 14 C.C.R. section 460 (effective 07/01/59) Furbearing mammals	Applicable	Regulation makes it unlawful to take Fisher, marten, river otter, desert kit fox, and red fox.	Action must be taken to avoid take of fur-bearing Animals. The desert kit fox is known from Fort Irwin.
	Fish and Game Code section 5515 (Added by Stats. 1970, c. 1036, p. 1849, section 8) Fully protected fish	Potentially Applicable	This section prohibits the take or possession of fully protected fish or parts thereof. The following are fully protected fish: (a) Colorado River squawfish (b) Thicktail chub (c) Mohave chub (d) Lost River sucker (e) Modoc sucker (f) Shortnose sucker (g) Humpback sucker (h) Owens River pupfish (i) Unarmored threespine stickleback (j) Rough sculpin	This section is applicable, relevant and appropriate to the extent that such fish species or their habitat are located on or near the sites. Actions must be taken to prevent the take or possession of any fully protected fish species.
Fort Irwin National Training Center		Applicable	Establishes requirements for obtaining excavation permits that requires sign-off by personnel in engineering, environmental and resource groups to ensure that excavation activities will not unnecessarily disturb areas of environmental or cultural significance.	Obtain permits prior to beginning work.



4.0 Site-Specific Work Plan

This section presents a description of the techniques and methods that will be used to perform the removal actions at FTIR-38 Area 2 and FTIR-40 Area 1.1, so that they meet the remedial action objectives and comply with ARARs, discussed in Section 3.0.

4.1 Removal Action Objectives

The specific goals for the removal action for FTIR-38 and FTIR-40 are to:

- Excavate and dispose of soil from 34 sample locations at FTIR-38 Area 2, based on the samples from the RI/FS exceeding cleanup goals and as developed in **Table 3-2, and shown in Figures 3-1 and 3-2**. Collect and analyze confirmation samples to verify that clean-up levels for the COCs have been achieved. After the removal of contaminated soils exceeding the site specific cleanup levels (**Table 3-1**), all remaining berm structures at FTIR-38 will be flattened to grade.
- Remove debris from FTIR-40 Area 1.1.
- Excavate and dispose of soil from two locations at FTIR-40 Area 1.1 to cleanup goals. Collect and analyze confirmation samples to verify that clean-up levels for the COCs have been achieved.
- Backfill the excavation in FTIR-40 Area 1.1 with clean soil to provide a clean soil cover over the area.

Site maps for FTIR-38 and FTIR-40 showing the areas of soil excavation are shown on **Figures 3-1 and 3-2**. The following subsections will discuss specific work elements to achieve the removal action objects including:

- Site Planning
- Site Security
- Site Reconnaissance
- Site Mobilization
- Soil Excavation and Screening
- Soil Sampling
- Dust Control and Air Monitoring
- Backfill and Site Restoration
- Closure Report

The following subsections describe the specific work elements for the FTIR-38 and FTIR-40 removal action projects to achieve the project objective of remediation by September 15, 2005, in accordance with state and federal regulations.



4.2 Site Planning

In planning for this project, MKM will meet with site personnel, environmental staff, and the regulatory agencies prior to preparing our planning. Key issues that will be discussed during these meetings will be the specific areas that pose a potential risk, methods to minimize the amount of soil excavated and disturbed areas, means to protect and/or mitigate disruption of potential habitat for the Mojave ground squirrel, communications and operational parameters. Coordination with the National Aeronautics and Space Administration (NASA) facility located next to the site will be a critical element of the site planning and coordination task. Any specific locations of archaeological significance as determined by the Fort Irwin Archaeologist will be flagged and vehicular movement will not be allowed in such demarcated areas.

Specific planning documents that have been prepared for the execution of this work include:

- SAP and QAP in **Appendix B**;
- SSHP in **Appendix C**; and
- MEC Avoidance and Construction Support Plan in **Appendix D**.

4.3 Cultural Resources

The Fort Irwin Archaeologist will be on site during the duration of the project to identify and conduct necessary actions to protect any discovered artifacts or human remains. In the event that artifacts or human remains are discovered, the list of Native American contacts provided by the Native American Heritage Commission will immediately be notified and given the opportunity participate in the proper disposition of the artifacts or remains.

4.4 Site Security

Site access at Fort Irwin is restricted to authorized personnel. All site personnel will comply with Fort Irwin security instructions upon entering Fort Irwin. Personnel will be required to have a valid picture identification and proof of insurance for all vehicles entering the site. There is an additional guarded entrance along Goldstone Road that leads to FTIR-38 and FTIR-40 that is associated with NASA. All personnel will comply with the additional access restrictions associated with NASA. Construction personnel will not enter any restricted areas at Fort Irwin unless prior approval is obtained from the Directorate of Public Works.

4.5 Site Reconnaissance

Once the project specific plans, such as the SSHP, MEC Avoidance and Construction Support Plan, and the SAP have been reviewed by the Army, MKM will conduct site reconnaissance. The goal of the site reconnaissance activities are to:

- Establish boundaries for site access roads and working areas;
- Identify and flag potential animal burrows within the boundaries of the work areas;
- Flag and demarcate locations of archaeological importance to avoid accidental or unintentional intrusion activities at these locations;
- Conduct utility clearances;



- Identify water sources for dust control as shown on **Figure 4-1**;
- Collect waste characterization samples of the soil to be excavated for acceptance by a landfill;
- Collect onsite borrow source samples and/or obtain certified laboratory data to verify that the material that will be imported is clean; and
- Establish field survey monuments.
- Obtain necessary operating permits from Air Quality Management District and Fort Irwin NTC.

A qualified field biologist and unexploded ordnance (UXO) personnel will work with the base environmental coordinator to identify both the route to the sites for MEC related debris and the special habitats and endangered species. If any MEC is identified, MKM will work with the facility explosive ordnance disposal (EOD) team, if necessary, to modify the ingress and egress routes and/or remove the MEC debris.

The ingress and egress routes will also be delineated to avoid disturbance of sensitive/endangered vegetation that may be present, such as the Lane Mountain Milk Vetch which is found in the Joshua Tree woodland and Creosote Brush, as well as obvious burrows for Mojave ground squirrel and potential migration paths for the Desert Tortoise. The routes will be clearly delineated with brightly colored stakes or flags, identifying the designated egress route within which all site personnel will drive.

MKM will work with utility locators contracted on the base to identify site utilities, have a baseline survey of the site performed, and establish coordinates for Global Positioning System (GPS). As part of our site preparation activities, a qualified field biologist will inspect the excavation areas for the presence of obvious burrows for the Mojave ground squirrel and burrowing owls. Mitigation measures for the Mohave ground squirrel and the burrowing owls are presented in **Appendix H**.

During this initial site visit, MKM will collect representative soil samples from the soils to be excavated. The soils will be screened for MEC debris and lead slugs using the same screening method we propose for the field operations and composited for submittal to the disposal facility for waste characterization. Two composite samples will be taken for FTIR-38; another composite sample will be taken for FTIR-40. These samples will be submitted for analysis (the actual analytical suite for the solid waste characterization samples will be per recommendations of the selected disposal facility) to a certified laboratory; the results will be submitted to the US Ecology disposal facility in Beatty, Nevada or any appropriate permitted disposal facility to ascertain conformance with the waste acceptance criteria and to obtain approval for waste disposal.

MKM has identified one onsite and two commercial borrow sources, specifically the onsite borrow source is located 3.7 miles south of the visitor center gate off Fort Irwin Road, the off-site borrow sources include Service Rock Products and Johnson's Rock and Sand in Barstow. Prior to use of any backfill borrow sources, MKM will either obtain certifications that the backfill is clean from the commercial borrow sources, or collect samples in accordance with the October, 2001 DTSC Information Advisory for Clean Imported Fill Material. The October, 2001



DTSC Information Advisory for Clean Imported Fill Material identifies sampling requirements for sources that are classified into broad groups such as Land near a Mining Area or Rock Quarry, Land near an existing freeway, Agricultural Land, and Residential/Acceptable Commercial Land. As a military base, Fort Irwin does not clearly fall into any of these categories, so in their comments to the draft RAW, the DTSC provided a list of specific analysis for onsite borrow material on Fort Irwin for this project, these analysis are included in our Sampling and Analysis Plan in Appendix B. MKM will evaluate the cost-benefit analysis in selection of the most appropriate borrow source that meets the site requirements for clean backfill. **Figure 4-2** shows the proposed location of the onsite borrow source and soil sample locations if it is cost effective to use on site borrow soils.

4.6 Site Mobilization

After the ingress and egress routes are clearly delineated and the soil is approved for disposal at a waste disposal facility, MKM will mobilize equipment and personnel to the site. Due to the small scope of this project and the need to minimize impacts to the sensitive desert environment, MKM will use large rubber-tired equipment rather than track-mounted equipment to minimize the impact to the site.

A small field utility trailer will be mobilized by MKM to provide shade, and to serve as storage for drinking water, safety and first aid equipment, and small hand tools. A portable toilet will also be provided. If the soil is to be disposed off-site rather than in an on-site landfill, MKM will mobilize portable truck scales to the site to ensure that trucks are loaded to an appropriate road-legal weight.

Areas to be excavated will be surveyed with Trimble GPS equipment, and staked. MKM will stake the excavation boundaries and establish an exclusion zone around each excavation area with a plastic fence. Separate personnel and equipment decontamination areas, and a support area. During field operations, MKM will establish and follow check-in and checkout procedures for entry onto the site and into the exclusion zone. All personnel entering the construction area are required to wear appropriate personal protective equipment.

All site personnel will be briefed on the planning documents including the health and safety plan, work plan, and environmental protection plan. Site personnel will be specifically instructed on driving in a manner (i.e. under 25 miles per hour on dirt areas) that reduces dust, specific MEC hazards, and methods to reduce disturbance of sensitive and endangered habitats, fauna, and flora.

4.7 Dust Control and Air Monitoring

The California State South Coast Air Quality District is the oversight agency for dust control and air monitoring at the Fort Irwin site. The Federal Clean Air Act of 1970, as amended in 1977 and 1990, and the South Coast Air Quality District regulations will be used as regulatory guidance for air monitoring and dust control requirements at the site.

The tasks that have the potential for generating dust during field activities include:

- Vehicle traffic on dirt roads;
- Excavation of soil;



- Screening of soil,
- Loading of trucks; and
- Backfill of excavations.

To control the dust generated from vehicular traffic on dirt roads, a maximum speed limit of 25 miles per hour will be strictly enforced and the dust from the dirt roads will be controlled by applying water directly on the soil using water sprayers. Similarly, generation of dust during excavation will be controlled by applying water directly to the excavation area. Spray units will be located at the screening area at the unloading points to provide direct water at the specific location where dust would be generated. Water for the sprayers will be supplied by a non-potable water container, filled daily or as needed. Trucks will be tarped prior to leaving the site to reduce dust from soil within the truck.

The objectives of the air monitoring program will be to:

- Determine background levels at the site;
- Measure potential impacts of construction activities; and
- Conduct personnel monitoring for health and safety concerns.

Prior to performing excavation activities, MKM will collect a single set of background samples for dust by walking the perimeter of the site with a direct reading dust monitor (Mini Ram PDM3 or equivalent). During construction activities the site perimeter will be monitored periodically, with a minimum frequency of at least once per day and with greater frequency depending on site activities. Monitoring will be conducted both upwind and downwind to assess impacts from off-site sources. Personnel air monitoring will be conducted in accordance with the SSHP.

4.8 Soil Excavation and Screening

MKM will alternate between excavation sites at FTIR-38 and FTIR-40 to minimize mobilizations and reduce the overall disturbance to the sensitive environment. Our overall plan is to start with FTIR-38, excavate and screen soil in accordance with the project plan, and collect confirmation samples of the excavated area. While awaiting laboratory results, our crew would move over to FTIR-40 and perform the site clearance and debris removal, excavate the soil, and collect confirmation samples. By alternating work on both sites, MKM could reduce down-time in the event that MEC was identified at either site and work had to be stopped while awaiting the Fort Irwin EOD team to arrive to deal with the MEC item. The following subsections discuss the process and procedures MKM will use to perform the excavation activities at the two sites.

MEC avoidance and construction support activities are summarized below and described in greater detail in **Appendix D**, MEC Avoidance and Construction Support Plan.

4.8.1 FTIR-38

FTIR-38 is located adjacent to an active, but infrequently (i.e., 1 to 4 times per month) used runway operated by the NASA Goldstone Deep Space Communications Complex. MKM will cease dust generating and MEC activities when the runway is being used by aircraft. MKM will maintain a 100 foot buffer between our site operations and the runway.



SECTION 4.0 – SITE SPECIFIC WORK PLAN

An estimated ten berms and five isolated spots outside the berms will be excavated at FTIR-38 Area 2 as shown on Figures 3-1 and 3-2, these areas will be staked during the site reconnaissance. Prior to moving to an excavation site, MKM will identify any potential Mojave ground squirrel burrows and burrowing owl burrows within the area to be excavated. A qualified wildlife biologist will be available to address, divert, and relocate special-status species that have the potential to occur at the site. If an active burrow or special-status specie is encountered, excavation activities will cease immediately and the qualified biologist will divert or relocate the animal from the site. Additional information is presented in **Appendix H** in the Mohave ground squirrel mitigation plan and the burrowing owl mitigation plan.

MKM will scan the area for MEC and MEC related items (i.e., items similar to MEC, but posing a lesser hazard such as MEC debris, to include scrap metal from ordnance). MKM will clear and consolidate surface scrap for recycle or disposal. Once the area has been cleared of surface scrap, MKM will excavate soil with a shielded rubber-tired backhoe or equivalent from areas identified in Figures 3-1 and 3-2 to the depths identified in Table 3-1. In suspected burrow areas, MKM will hand dig soil as a precautionary measure in order to mitigate harm to special-status species.

Once an excavation is completed to the designed depth and size, MKM will collect soil samples from the bottom and each sidewall of the excavation and analyze the samples for aluminum and lead by USEPA method 6010B using Severn Trent Laboratory (STL) in Los Angeles or other approved location, an accredited laboratory under the DTSC Environmental Laboratory Accreditation Program (ELAP). If sampling analysis results are above the cleanup goals for lead or aluminum, MKM will excavate additional soil. The volume of additional soil will be based on the concentration measured by the laboratory, as an example, if the concentration of lead or aluminum is significantly greater than the site specific cleanup goal, the lateral boundary of the excavation may be extended up to five feet prior to resampling and field screening. However if the concentration is near the cleanup goal, the excavation may only be extended one bucket width wide, prior to resampling and field screening. The depth of the excavations will be to the depth where the site specific cleanup goals are not exceeded. Following additional excavation soil samples will be collected for certified laboratory analysis as discussed in Section 4.8.

Excavated soil will be screened for metal debris (from MEC) and any potential lead slugs. Initially the screening unit will have dual screens with a 2-inch and ½-inch sieve sizes; these sieve sizes may be modified in the field based on the soil type and scrap found.

UXO technicians will inspect the items retained on the upper screen and identify suspected MEC related items. Suspected MEC related items will be inspected by the UXO technicians for fuzes. If fuzed item(s) are identified, MKM will stop work and immediately contact the Fort Irwin EOD team to dispose of the item(s). If non-fuzed MEC related items are encountered, MKM UXO specialists will test the items for explosive residue with EXPRAY kits or other appropriate field testing method. Items with detectable explosives will be set aside for disposal by the Fort Irwin EOD team at the end of each work day. After inspection, items with no detectable explosives will be certified as inert by the UXO Quality Control Specialist and disposed of as scrap metal.

Once MEC and MEC related materials have been removed from the screen, lead slugs retained on the finer screen will be loaded directly into drums and taken to a recycler. Screened soils will be staged temporarily on a liner and will be loaded on to a truck upon obtaining adequate volume



SECTION 4.0 – SITE SPECIFIC WORK PLAN

for each truckload. Stock piling of screened soils for extended periods of time is not anticipated at this time. Water sprayers will be used to reduce dust. The trucks will be located outside of the exclusion zone and the exterior of the trucks will not come in contact with contaminated soil. As an additional safeguard, the tires of the trucks will be scraped and/or swept for dirt prior to leaving the site. Trucks will be tarped and weighed prior to leaving the site. If the soil must be disposed off-site, Hazardous Waste Manifests will be prepared for signature by the Army representative. Licensed hazardous waste transporters will transport the soil to the permitted US Ecology TSD in Beatty, NV or other permitted TSD. After all excavation and backfill activities are complete, the remaining berm structures will be flattened to grade. Prior to grading of the remaining berm structures, UXO personnel will use a Schonstedt Fluxgate Magnetic Locator to perform UXO avoidance on the berm structures. The Schonstedt Magnetic Locators are highly portable magnetometers that will be used to quickly screen surface and near-surface areas for ferrous content.

4.8.2 FTIR-40

During the site walk, MKM identified several apparently inert bomb casings on the surface. These casings and other potential MEC related items will be tested for explosives using an EXPRAY kit or other appropriate field testing method. If explosives are detected, MKM will call the Fort Irwin EOD team and turn the items over to the EOD team for destruction. If the casings do not have residual explosives, MKM will render the projectiles unusable (i.e., if the casings and fuze wells are intact, MKM will crush the casing and/or destroy the fuze well threading based on the size and configuration of the casings). The casings and other debris found free of explosives will be placed in a roll-off bin for disposal in the post sanitary landfill.

Once the area has been cleared of surface debris and scanned for evidence of MEC related items, MKM will excavate soil with a shielded rubber-tire backhoe or equivalent to a depth of approximately 3.5 feet identified in Table 3-3 and shown on Figure 3-3. In suspected burrow areas, MKM will hand dig soil as a precautionary measure in order to mitigate harm to special-status species. Once the hot spots have been excavated to the designed depth, MKM will collect soil samples from the bottom and sidewalls of the excavation for laboratory analysis of copper and lead. As discussed in Section 4.7.1, if the laboratory analysis are greater than the cleanup goals, additional soil will be excavated, soil samples will be collected for certified laboratory analysis as discussed in Section 4.8.

The excavated soil will be moved to a screening area to screen the soil for metal debris and lead slugs. Metal debris will be inspected and handled by UXO Technicians as discussed in Section 4.7.1. Screened soils will be staged temporarily on a liner and will be loaded on to a truck upon obtaining adequate volume for each truckload. Stock piling of screened soils for extended periods of time is not anticipated at this time. The trucks will be located outside of the exclusion zone and the exterior of the trucks will not come in contact with contaminated soil. As an additional safeguard, the tires of the trucks will be scrapped and/or swept for dirt prior to leaving the site. These trucks will be tarped, the trucks will be weighed and a Hazardous Waste Manifest will be prepared for signature by the Army representative. The soil will be transported to the US Ecology permitted TSD in Beatty, Nevada or other permitted TSD by a licensed hazardous waste transporter.



4.9 Sampling and Analysis

Following excavation activities, MKM will collect soil samples at the same locations for analysis by a certified analytical laboratory on a rapid (1 or 2 day) turn-around. MKM will collect five grab samples per excavation – one from the bottom of the excavation and one from each sidewall – label the samples and place the samples on ice for shipment to a certified analytical laboratory. The soil samples collected from FTIR-38 will be analyzed for lead and aluminum. The samples collected from FTIR-40 will be analyzed for lead and copper. All the soil samples will be analyzed on a rapid turn-around.

Laboratory services will adhere to MKM's SAP and QAP within the RAW. These plans detail the requirements to obtain data of sufficient quality to meet the intended usages and requirements within the project. At a minimum, these documents will identify the required sampling, analysis, and quality control activities required to meet the project Data Quality Objectives.

MKM has identified STL Los Angeles as our primary analytical laboratory for this contract. STL has current USACE and DTSC ELAP certification and participates in several certifying and validating programs, which include various on-site audits and performance evaluation sample analysis.

4.10 Backfill and Site Restoration

In order to reduce mobilizations, MKM will alternate backfilling operations, by performing backfilling at FTIR-38 once the laboratory data are in and below risk based levels. If an excavation extends beyond the berm structures, the area will be backfilled to original grade as needed. Once the contaminated soil above the site specific cleanup goals are removed from the berm structures, all berm structures at FTIR-38 Area 2 will be flattened to grade. Then, once the analytical data are available for FTIR-40 and are below risk based levels, our backfill crew will move over to FTIR-40. Soil will be brought in from the selected borrow site, as discussed in Section 4.1, and trucked to the site. Soil will be placed in 6-inch lifts, wetted with water and compacted with a rubber tired compactor; the area will be graded to prevent ponding of storm water run-off.

4.11 Closure Report

A construction completion report will be prepared that will include a written and photographic summary of field activities, deviations, if any from the RAW, confirmation sampling data, extent of excavations, disposition of MEC materials, and disposal and transportation records for the disposal of contaminated soil. The Construction Summary Report will include Electronic Data Deliverables consistent with the U.S. Army Environmental Restoration Information Management System format. Draft documents will be prepared for Army and Agency review; a final document will incorporate comments from the Army and Agencies.



5.0 References

- California Code of Regulations 1998, Health and Safety Code Section 25356.1 Remedial Action Program.
- California Environmental Protection Agency (CalEPA), 1998. Removal Action Work Plans Technical Memorandum. September.
- Cal EPA, June 2003, Fact Sheet Supplemental Site Investigation and Removal Action Work Plan Process.
- CalEPA, October 2001, Information Advisory Clean Imported Fill Material
- Krzysik, 1994. Mojave ground squirrel at Fort Irwin, California. A State Threatened Species. U.S. Army Corps of Engineers Construction Engineering Research Laboratories (USACERL) Technical Report EN094/09. September.
- Montgomery Watson Harza (MWH), 1997. Data Summary Report: Site Investigation of Seven Sites: FTIR-32A (Lower Goat Mountain Landfill), FTIR-32A (Upper Goat Mountain Landfill), FTIR-32B, FTIR-25E, FTIR-38, FTIR-39, and FTIR-40. December.
- MWH, 1998. Site Investigation of Four Sites: FTIR-32A (Lower Goat Mountain Landfill), FTIR-38, FTIR-39, and FTIR-40. September.
- MWH, 1999. (Draft) Workplan for Sites FTIR-32A, FTIR-39, FTIR-39, and FTIR-40. March.
- MWH, 2003 Final Remedial Investigation/Feasibility Study for Site FTIR-38 and FTIR-40, National Training Center, Fort Irwin. March
- Parsons Engineering Science, Inc. (Parsons ES), 1995. Project Workplan for the Site Inspection and Remedial Investigation of 31 Sites at National Training Center Fort Irwin, California. October.
- Parsons ES, 1996. Technical Memorandum NTC Fort Irwin Statistical Analysis of Background Data Fort Irwin, California. December.
- Whitaker, J.O. (Editor), 1996. National Audobon Society Field Guide to North American Mammals. Chanticleer Press Inc., New York.
- Welsh, S.O. and N.M. Marston, 1982. Review of Trends in Food Use in the United States, 1909- 1980, J. Am. Diet. Assoc., 81:120-125.
- Zeiner, D., W.F. Laudenslayer, K.E. Mayer, and M. White (Editors), 1990. California's Wildlife. Volume 1, 11, HI. California Department of Fish and Game.
- Zemba and Gall, 1980. Observations on Mojave ground squirrels, (*Spermophilus mohavensis*), in Inyo County, California. J. Mammal, 61:347-350.



Appendix A – Administrative Record



Appendix B – Sampling and Analysis Plan and Quality Assurance Plan



Appendix C – Site Specific Health and Safety Plan



Appendix D – Munitions and Explosives of Concern (MEC) Avoidance and Construction Support Plan



Appendix E Waste Minimization Plan and Storm Water Pollution Prevention Plan



Appendix F Mitigated Negative Declaration and CEQA Process



Appendix G Recalculation of Lead Cleanup Goal



Appendix H Mohave Ground Squirrel Mitigation and Burrowing Owl Plans



Appendix I Response to Agency Comments



Appendix J Agency Approval Letters